OFFICE OF MANNED SPACE FLIGHT PROGRAM DIRECTIVE	M-D ML 3200.059 (Project)	DATE May 23, 1968

APOLLO APPLICATIONS
PROGRAM DIRECTIVE NO. 5A

TO : Distribution

FROM: John H. Disher for
DIRECTOR, APOLLO APPLICATIONS

SUBJECT: Change 1 to Apollo Applications Program Directive No. 5A

The attached changes are to be incorporated into the subject directive on a page-for-page substitution basis. This memorandum shall be attached to the basic document and become part of the directive. Substance of the changes is as follows:

a. Delete requirement for determining feasibility of reactivating the Saturn I Workshop for up to 56 days. This requirement will be met on the AAP-3A Mission.

b. Delete requirement for verification of ability of ground support systems to support extended duration missions. This requirement will be verified for up to 56 days on the AAP-3A Mission.

c. Rephrase secondary objectives statement to include requirement for reactivating Saturn I Workshop experiments.

d. Provide for automatic rendezvous and remotely controlled docking of the LM/ATM.

e. Provide for execution of a CSM-LM/ATM alternate mission.

f. Reactivation and reuse of LM/ATM are now design objectives rather than firm mission requirements. Designs which preclude reactivation and reuse will be submitted for approval prior to implementation.

g. Update general flight plan to new LM/ATM rendezvous and docking concept.

h. Update LM/ATM and CSM configuration requirements.

i. Update AAP-3 experiment priority listing.

Changes are underlined to facilitate identification.

Attachments
(Pages 2, 3, 4, 5, 6 & 7)

c. Determine feasibility of reactivating and reusing a Saturn I Workshop as a base of operations for support of a solar observation system and for the conduct of both new and reactivated experiments in science, applications, technology, engineering and medicine.

2.0 MISSION OBJECTIVES

2.1 Primary Objectives: The primary objectives of the AAP-3/AAP-4 Mission are listed below. They may be amplified but not modified by the centers. Preflight malfunctions of spacecraft or launch vehicle systems, ground equipment or instrumentation which would result in failure to meet these objectives will be cause to hold or cancel the mission until the malfunction has been eliminated.

a. Obtain scientific data on the physical characteristics of the sun through observations of various portions of the electromagnetic spectrum made with the Apollo Telescope Mount (ATM) experiments (Experiments S052, S054, S056, S082, S083).

b. Obtain engineering data from the operation of the ATM attached to a Lunar Module (LM) ascent stage to support development of an advanced manned orbital observatory.

c. Demonstrate automatic rendezvous and hard dock of the unmanned, remotely controlled LM/ATM to the Multiple Docking Adapter of the Saturn I Workshop left in orbit from Mission AAP-1/AAP-2.

d. Determine feasibility of reactivating and operating a Saturn I Workshop (Experiment M402 and elements of M487) as a base of operations for support of a solar observation system.

2.2 Secondary Objectives: The secondary objectives of Mission AAP-3/AAP-4 are summarized below. Preflight malfunctions of spacecraft or launch vehicle systems, ground equipment or instrumentation which would result in failure to meet these objectives may be cause to hold or cancel the mission as specified in the Mission Rules.

Conduct both new and reactivated experiments in the Saturn I Workshop. The following data will be obtained:

a. Space flight environmental effects on the crew of a mission up to 56 days (Experiments M018, M050, M051, M052, M053, M055, M056, M058).

b. Engineering and technological information for the development of advanced space vehicles and equipment (Experiments M487, T018).

c. Bioscience information (Experiment S061).

3.0 GENERAL FLIGHT PLAN

3.1 Launch Vehicle Powered Flight:

a. AAP-3 is a manned flight involving a Saturn IB launch vehicle, a modified Apollo Block II CSM and resupply provisions as needed to sustain a 56-day mission. It will be launched from LC 34 at KSC at a time and azimuth to facilitate rendezvous with the Saturn I Workshop. Injection orbit will be 81 x 120 n. mi. nominal.

b. AAP-4 is an unmanned flight involving a Saturn IB launch vehicle, the ascent stage of an Apollo Lunar Module and the ATM. It will be launched from LC 37B at KSC at a time and azimuth to facilitate automatic rendezvous with the Saturn I Workshop. Nominal insertion orbit will be 210 x 210 n. mi.

3.2 Spacecraft Flight Profile: The launch timing and orbital inclination of the AAP-3 spacecraft will be selected to permit expeditious rendezvous with the Saturn I Workshop. After injection into orbit, the CSM will separate from the SLA and make the requisite transitional maneuvers to rendezvous with the Saturn I Workshop. The CSM will dock to the axial port of the Multiple Docking Adapter and the Saturn I Workshop will be reactivated for habitation.

The LM/ATM will effect automatic rendezvous with the Saturn I Workshop. It will then be hard docked to a radial port of the Multiple Docking Adapter by remote control exercised from within the Saturn I Workshop.

At the conclusion of the mission, the Saturn I Workshop will be placed in an orbital storage mode and the CSM will separate from the MDA. The CM will then return to earth using the service module SPS to provide the primary deorbit impulse. Emergency use of the RCS system for deorbit backup will be provided.

3.3 CSM-LM/ATM Alternate Mission: In the event the Saturn I Workshop is determined to be uninhabitable before initiation of the AAP-3/AAP-4 Mission, planning shall provide for an alternate mission to be executed with the AAP-3 CSM hard docked to the AAP-4 LM/ATM. All spacecraft and ground support equipment modifications prerequisite to accomplishment of this mission will be completed prior to launch of AAP-3. Further details pertinent to this alternate mission will be contained in a subsequent mission directive.

3.4 Recovery: Water recovery to be developed consistent with the above-stated profile characteristics and the normal recovery constraints associated with the deployment of recovery forces and the local lighting conditions at the time of recovery.

3.5 Mission Support Requirements: These requirements will be supplied in a "Program Support Requirements" document to be issued by the Operations Support Requirements Office, Mission Operations, OMSF, not later than four months prior to launch.

4.0 CONFIGURATION

4.1 Launch Vehicles: Saturn IB launch vehicles as assigned by references (a) and (b) will be used for the AAP-3 and AAP-4 flights. A spacer will be incorporated on AAP-4 between the IU and SLA to provide adequate space for integration of the LM/ATM into the SLA. Other modifications will be limited to the minimum necessary to achieve proper trajectory stabilization and control.

4.2 Nose Cone: A nose cone as designed for an unmanned Apollo LM launch will provide an aerodynamic shroud for AAP-4. The nose cone will be jettisoned during powered flight.

4.3 LM/ATM:

a. The LM/ATM will consist of a solar observation experiment package and support subsystems mounted to a modified Lunar Module ascent stage. The LM descent stage will not be utilized.

b. The ATM consists of the following subsystems:

(1) Solar astronomy experiments.

(2) Rack and Experiments Package structure.

(3) Electrical power.

(4) Pointing control.

(5) Thermal control.

(6) Instrumentation and Communication.

c. The Lunar Module ascent stage will be modified to:

(1) Provide automatic launch vehicle-LM/ATM separation and rendezvous with the Saturn I Workshop.

(2) Provide automatic station keeping with the Saturn I Workshop after rendezvous.

(3) Provide for docking of the unmanned LM/ATM to the MDA by remote control.

(4) Incorporate the controls and displays for the operation of the ATM experiments and support subsystems.

d. The LM/ATM shall be capable of:

(1) Operating docked to the Saturn I Workshop in the primary mode.

(2) Operating docked to the CSM in a backup mode.

Umbilical connections shall be provided for contingency transfer of electrical power between the LM and other cluster modules as dictated by mission requirements.

4.4 The AAP-3 CSM will be a standard Block II Apollo configuration modified to:

a. Operate with the Airlock and hard dock to the MDA as dictated by mission requirements.

b. Carry and support experiment hardware.

c. Incorporate resupply provisions as needed to sustain a 56-day mission.

d. Provide an extended capability RCS system as required to accomplish mission objectives.

e. Provide for use of the RCS system as an emergency deorbit backup.

f. Provide a control system for cluster reactivation and regulation of the two-gas life support system.

g. Incorporate 56-day fuel cells.

h. Provide cryogenic consumables to support fuel cell power generation for a 56-day mission.

i. Provide for power transfer between the CSM and the Airlock power distribution system.

j. Permit utilization of the communications system as a cluster voice communications center.

k. Operate hard docked to the LM/ATM in a backup mode.

4.5 SLA: The SLA for AAP-4 will be modified as necessary to accommodate launch of the LM/ATM and be jettisoned during powered flight.

5.0 EXPERIMENTS

The following experiments are assigned for execution on AAP-3/AAP-4. They are listed in relative order of priority by flight, subject to MSFEB approval.

5.1 AAP-3:

Objective	Exp. No.	Status*	Title	Dev. Center	Launch Location
Primary	M402R	R	Orbital Workshop	MSFC	--
Secondary	M487R	R	Habitability/Crew Quarters	MSFC	--
Secondary	M051R	R	Cardiovascular Function Assessment	MSC	--
Secondary	M050R	R	Metabolic Activity	MSC	--
Secondary	M052R	R	Bone and Muscle Changes	MSC	--
Secondary	M056R	R	Non-Gravimetric Mass Measurement	MSC	--
Secondary	M058R	R	Human Mass Measurement Device	MSC	--
Secondary	M053R	R	Human Vestibular Function	MSC	--
Secondary	M018R	R	Vectorcardiogram	MSC	--
Secondary	M055R	R	Time and Motion Study	MSC	--
Secondary	S061	N	Potato Respiration	MSC	CM
Secondary	T018	N	Precision Optical Tracking	MSFC	IU

5.2 AAP-4:

Primary	S083	N	UV Scanning Spectrometer	MSFC	ATM
Primary	S082	N	UV Spectrograph/Heliograph	MSFC	ATM
Primary	S052	N	White Light Coronagraph	MSFC	ATM
Primary	S054	N	X-ray Spectrographic Telescope	MSFC	ATM
Primary	S056	N	Dual X-ray Telescopes	MSFC	ATM
Secondary	T018	N	Precision Optical Tracking	MSFC	IU

*Status: R - Designates experiment performed on AAP-1/AAP-2 Mission and scheduled for reactivation and reuse on AAP-3/AAP-4. Only those elements of hardware prerequisite to repetition will be transported to orbit.

N - Designates new experiment.

5.3 Implementation: The following instructions are established for development, payload integration and mission planning activities associated with the above experiments. As experiment development, payload weight status and crew time line activities progress, revisions to these instructions will be published as required.

OFFICE OF MANNED SPACE FLIGHT PROGRAM DIRECTIVE	M-D ML 3200.059 (Project)	DATE May 23, 1968

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MOR/Brown (10)
MP/Kubat (2)
MPP/Rafel (2)
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MS/White
MSR/Davis
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MTE/Wild
MTG/Hall
MTX/Hall
MTX/Mogavero (2)
MTY/Dixon

ML/Luskin
MLD/Disher
ML-1/Levenson
MLA/Culbertson (12)
MLG/Hubbard
MLO/Edwards (5)
MLP/Field (12)
MLP-4/Koutsandreas (5)
MLP-5/Little (3)
MLR/Cohen (5)
MLS/Hagner (7)
MLT/Savage (13)
MLV/Fero

OSSA
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SD/Nicks
SA/Jaffe
SB/Reynolds
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RE/Sullivan
RF/Ginter
RN/Woodward
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RNV/Novik (5)
RP/Tischler
RV/Ames

XP/Jones (2)

OTDA
T/Truszynski
TD/Brockett
TA/Morrison
TS/Pozinsky
TR/Bryant

OPPA
PT/Maggin

GSFC
210/Stroud
300/Covington
310/Roberts
320/Wood
550/Vonbun

KSC
CD/Debus
DM/Siepert
DO/Ross
AD/VanStaden
AA/Morgan
AA-ADV/Hock
AA-SVO/Raffaelli (60)
LO/Petrone
AP/Middleton
EX/Murphy
TS/Clark
DE/Preston
IS/Miller
SO-PLN/Manton

MSC
AA/Gilruth
AB/Deputy Director
AD/West
KA/Thompson (85)
PA/Low (5)
PA/Rees
EA/Paget
TA/Hess (5)
ET/Stoney
FA/Kraft (2)
FA4/Fielder
FC/Hodge (8)
FM/Mayer (2)
FM14/Parten (3)
FL/Hammack
FS/Dunseith (2)
FS/Kirk

MSC (Continued)
CA/Slayton
CB/Astronauts' Office (4)
CF/North (2)
CF32/Kuehmel (2)
CF34/Jones (2)
DA/Berry
DA2/Coons
AR5/Menear (2)
ZR-1/Green
TE/Jackson

MSFC
DIR/Von Braun
EX/Maus
I-S/AA-MGR/Belew (15)
I-RM-M/Goldston (60)
(Data Manager)

GENERAL ELECTRIC
Demos (2)

OFFICE OF MANNED SPACE FLIGHT

APOLLO APPLICATIONS PROGRAM

PROGRAM DIRECTIVE NO. 5A

FLIGHT MISSION DIRECTIVE FOR AAP-3/AAP-4

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

OFFICE OF MANNED SPACE FLIGHT PROGRAM DIRECTIVE	M-D ML 3200.059 (Project)	DATE May 23, 1968

APOLLO APPLICATIONS
PROGRAM DIRECTIVE NO. 5A

REFERENCE COPY

TO : Distribution

FROM: John H. Disher for
DIRECTOR, APOLLO APPLICATIONS

SUBJECT: Change 1 to Apollo Applications Program Directive No. 5A

The attached changes are to be incorporated into the subject directive on a page-for-page substitution basis. This memorandum shall be attached to the basic document and become part of the directive. Substance of the changes is as follows:

a. Delete requirement for determining feasibility of reactivating the Saturn I Workshop for up to 56 days. This requirement will be met on the AAP-3A Mission.

b. Delete requirement for verification of ability of ground support systems to support extended duration missions. This requirement will be verified for up to 56 days on the AAP-3A Mission.

c. Rephrase secondary objectives statement to include requirement for reactivating Saturn I Workshop experiments.

d. Provide for automatic rendezvous and remotely controlled docking of the LM/ATM.

e. Provide for execution of a CSM-LM/ATM alternate mission.

f. Reactivation and reuse of LM/ATM are now design objectives rather than firm mission requirements. Designs which preclude reactivation and reuse will be submitted for approval prior to implementation.

g. Update general flight plan to new LM/ATM rendezvous and docking concept.

h. Update LM/ATM and CSM configuration requirements.

i. Update AAP-3 experiment priority listing.

Changes are underlined to facilitate identification.

Attachments
(Pages 2, 3, 4, 5, 6 & 7)

OFFICE OF MANNED SPACE FLIGHT PROGRAM DIRECTIVE	M-D ML 3200.059 (Project)	DATE February 12, 1968

APOLLO APPLICATIONS
PROGRAM DIRECTIVE NO. 5A

TO : Distribution

FROM: Clark W. Matthews
DIRECTOR, APOLLO APPLICATIONS

SUBJECT: Flight Mission Directive for Mission AAP-3/AAP-4

REF : (a) Apollo Applications Flight Mission Assignments Directive, M-D ML 3200.056, dated January 1967
(b) Apollo Applications Planning Schedule, ML-13A, dated January 5, 1968
(c) Apollo Flight Mission Assignments Directive, M-D MA 500-11, dated January 1968
(d) Apollo Applications Test Requirements Document, NHB 8080.3, dated October 13, 1967
(e) Apollo Program Directive No. 6A dated August 30, 1966
(f) Apollo Program Directive No. 15 dated January 25, 1966
(g) Reliability and Quality Assurance Plan, NHB 5300.5, dated May 1967

PURPOSE: This directive defines AAP requirements and responsibilities to initiate those actions prerequisite to execution of the AAP-3/AAP-4 Mission authorized in reference (a). The mission is scheduled for launch as indicated in reference (b) in the event that the launch vehicles and spacecraft assigned to the Apollo-Saturn missions, reference (c), are not required to support the mainline Apollo Program. This directive supersedes Apollo Applications Program Directive No. 5 dated March 27, 1967.

1.0 MISSION PURPOSE

The purposes of Mission AAP-3/AAP-4 are to:

a. Increase man's knowledge of the characteristics of the sun by conducting solar astronomy observations in space.

b. Conduct an operational evaluation of the performance characteristics of a manned solar astronomy system to provide engineering an scientific data essential to the development of advanced orbital solar and stellar observation systems.

c. Determine feasibility of reactivating and reusing a Saturn I Workshop as a base of operations for support of a solar observation system and for the conduct of both new and reactivated experiments in science, applications, technology, engineering and medicine.

2.0 MISSION OBJECTIVES

2.1 Primary Objectives: The primary objectives of the AAP-3/AAP-4 Mission are listed below. They may be amplified but not modified by the centers. Preflight malfunctions of spacecraft or launch vehicle systems, ground equipment or instrumentation which would result in failure to meet these objectives will be cause to hold or cancel the mission until the malfunction has been eliminated.

a. Obtain scientific data on the physical characteristics of the sun through observations of various portions of the electromagnetic spectrum made with the Apollo Telescope Mount (ATM) experiments (Experiments S052, S054, S056, S082, S083).

b. Obtain engineering data from the operation of the ATM attached to a Lunar Module (LM) ascent stage to support development of an advanced manned orbital observatory.

c. Demonstrate automatic rendezvous and hard dock of the unmanned, remotely controlled LM/ATM to the Multiple Docking Adapter of the Saturn I Workshop left in orbit from Mission AAP-1/AAP-2.

d. Determine feasibility of reactivating and operating a Saturn I Workshop (Experiment M402 and elements of M487) as a base of operations for support of a solar observation system.

2.2 Secondary Objectives: The secondary objectives of Mission AAP-3/AAP-4 are summarized below. Preflight malfunctions of spacecraft or launch vehicle systems, ground equipment or instrumentation which would result in failure to meet these objectives may be cause to hold or cancel the mission as specified in the Mission Rules.

Conduct both new and reactivated experiments in the Saturn I Workshop. The following data will be obtained:

a. Space flight environmental effects on the crew of a mission up to 56 days (Experiments M018, M050, M051, M052, M053, M055, M056, M058).

b. Engineering and technological information for the development of advanced space vehicles and equipment (Experiments M487, T018).

c. Bioscience information (Experiment S061).

3.0 GENERAL FLIGHT PLAN

3.1 Launch Vehicle Powered Flight:

a. AAP-3 is a manned flight involving a Saturn IB launch vehicle, a modified Apollo Block II CSM and resupply provisions as needed to sustain a 56-day mission. It will be launched from LC 34 at KSC at a time and azimuth to facilitate rendezvous with the Saturn I Workshop. Injection orbit will be 81 x 120 n. mi. nominal.

b. AAP-4 is an unmanned flight involving a Saturn IB launch vehicle, the ascent stage of an Apollo Lunar Module and the ATM. It will be launched from LC 37B at KSC at a time and azimuth to facilitate automatic rendezvous with the Saturn I Workshop. Nominal insertion orbit will be 210 x 210 n. mi.

3.2 Spacecraft Flight Profile: The launch timing and orbital inclination of the AAP-3 spacecraft will be selected to permit expeditious rendezvous with the Saturn I Workshop. After injection into orbit, the CSM will separate from the SLA and make the requisite transitional maneuvers to rendezvous with the Saturn I Workshop. The CSM will dock to the axial port of the Multiple Docking Adapter and the Saturn I Workshop will be reactivated for habitation.

The LM/ATM will effect automatic rendezvous with the Saturn I Workshop. It will then be hard docked to a radial port of the Multiple Docking Adapter by remote control exercised from within the Saturn I Workshop.

At the conclusion of the mission, the Saturn I Workshop will be placed in an orbital storage mode and the CSM will separate from the MDA. The CM will then return to earth using the service module SPS to provide the primary deorbit impulse. Emergency use of the RCS system for deorbit backup will be provided.

3.3 CSM-LM/ATM Alternate Mission: In the event the Saturn I Workshop is determined to be uninhabitable before initiation of the AAP-3/AAP-4 Mission, planning shall provide for an alternate mission to be executed with the AAP-3 CSM hard docked to the AAP-4 LM/ATM. All spacecraft and ground support equipment modifications prerequisite to accomplishment of this mission will be completed prior to launch of AAP-3. Further details pertinent to this alternate mission will be contained in a subsequent mission directive.

3.4 Recovery: Water recovery to be developed consistent with the above-stated profile characteristics and the normal recovery constraints associated with the deployment of recovery forces and the local lighting conditions at the time of recovery.

3.5 Mission Support Requirements: These requirements will be supplied in a "Program Support Requirements" document to be issued by the Operations Support Requirements Office, Mission Operations, OMSF, not later than four months prior to launch.

4.0 CONFIGURATION

4.1 Launch Vehicles: Saturn IB launch vehicles as assigned by references (a) and (b) will be used for the AAP-3 and AAP-4 flights. A spacer will be incorporated on AAP-4 between the IU and SLA to provide adequate space for integration of the LM/ATM into the SLA. Other modifications will be limited to the minimum necessary to achieve proper trajectory stabilization and control.

4.2 Nose Cone: A nose cone as designed for an unmanned Apollo LM launch will provide an aerodynamic shroud for AAP-4. The nose cone will be jettisoned during powered flight.

4.3 LM/ATM:

a. The LM/ATM will consist of a solar observation experiment package and support subsystems mounted to a modified Lunar Module ascent stage. The LM descent stage will not be utilized.

b. The ATM consists of the following subsystems:

(1) Solar astronomy experiments.

(2) Rack and Experiments Package structure.

(3) Electrical power.

(4) Pointing control.

(5) Thermal control.

(6) Instrumentation and Communication.

c. The Lunar Module ascent stage will be modified to:

(1) Provide automatic launch vehicle-LM/ATM separation and rendezvous with the Saturn I Workshop.

(2) Provide automatic station keeping with the Saturn I Workshop after rendezvous.

(3) Provide for docking of the unmanned LM/ATM to the MDA by remote control.

(4) Incorporate the controls and displays for the operation of the ATM experiments and support subsystems.

d. The LM/ATM shall be capable of:

(1) Operating docked to the Saturn I Workshop in the primary mode.

(2) Operating docked to the CSM in a backup mode.

Umbilical connections shall be provided for contingency transfer of electrical power between the LM and other cluster modules as dictated by mission requirements.

4.4 The AAP-3 CSM will be a standard Block II Apollo configuration modified to:

a. Operate with the Airlock and hard dock to the MDA as dictated by mission requirements.

b. Carry and support experiment hardware.

c. Incorporate resupply provisions as needed to sustain a 56-day mission.

d. Provide an extended capability RCS system as required to accomplish mission objectives.

e. Provide for use of the RCS system as an emergency deorbit backup.

f. Provide a control system for cluster reactivation and regulation of the two-gas life support system.

g. Incorporate 56-day fuel cells.

h. Provide cryogenic consumables to support fuel cell power generation for a 56-day mission.

i. Provide for power transfer between the CSM and the Airlock power distribution system.

j. Permit utilization of the communications system as a cluster voice communications center.

k. Operate hard docked to the LM/ATM in a backup mode.

4.5 SLA: The SLA for AAP-4 will be modified as necessary to accommodate launch of the LM/ATM and be jettisoned during powered flight.

5.0 EXPERIMENTS

The following experiments are assigned for execution on AAP-3/AAP-4. They are listed in relative order of priority by flight, subject to MSFEB approval.

5.1 AAP-3:

Objective	Exp. No.	Status*	Title	Dev. Center	Launch Location
Primary	M402R	R	Orbital Workshop	MSFC	--
Secondary	M487R	R	Habitability/Crew Quarters	MSFC	--
Secondary	M051R	R	Cardiovascular Function Assessment	MSC	--
Secondary	M050R	R	Metabolic Activity	MSC	--
Secondary	M052R	R	Bone and Muscle Changes	MSC	--
Secondary	M056R	R	Non-Gravimetric Mass Measurement	MSC	--
Secondary	M058R	R	Human Mass Measurement Device	MSC	--
Secondary	M053R	R	Human Vestibular Function	MSC	--
Secondary	M018R	R	Vectorcardiogram	MSC	--
Secondary	M055R	R	Time and Motion Study	MSC	--
Secondary	S061	N	Potato Respiration	MSC	CM
Secondary	T018	N	Precision Optical Tracking	MSFC	IU

5.2 AAP-4:

Primary	S083	N	UV Scanning Spectrometer	MSFC	ATM
Primary	S082	N	UV Spectrograph/Heliograph	MSFC	ATM
Primary	S052	N	White Light Coronagraph	MSFC	ATM
Primary	S054	N	X-ray Spectrographic Telescope	MSFC	ATM
Primary	S056	N	Dual X-ray Telescopes	MSFC	ATM
Secondary	T018	N	Precision Optical Tracking	MSFC	IU

*Status: R - Designates experiment performed on AAP-1/AAP-2 Mission and scheduled for reactivation and reuse on AAP-3/AAP-4. Only those elements of hardware prerequisite to repetition will be transported to orbit.

N - Designates new experiment.

5.3 Implementation: The following instructions are established for development, payload integration and mission planning activities associated with the above experiments. As experiment development, payload weight status and crew time line activities progress, revisions to these instructions will be published as required.

a. Development and carrier integration activities will continue for all experiments listed.

b. Guidance for operational planning will be furnished on completion of feasibility studies now in progress.

6.0 SUPPORTING GROUND TEST CONSTRAINTS

Test program will be conducted in accordance with the Apollo Applications Test Requirements document (reference (d)) and appropriate test specifications. Mission Requirements documents prepared by the centers in support of these missions will identify by inclusion or reference the test constraints which must be lifted prior to mission execution.

6.1 Qualification: Components of the spacecraft, launch vehicles, nose cone, SLA, LM/ATM, flight experiment hardware and associated support systems whose failure would jeopardize either crew safety (Category I) or the accomplishment of a primary mission objective (Category II) and which have not been flight tested will be ground qualified and/or certified prior to launch as described in Appendix D of reference (d). Basic Apollo hardware which has been flight tested (i.e., CSM) will be subjected to additional ground qualification and/or certification tests as required to provide confidence in meeting the long duration and other pertinent AAP requirements.

6.2 Launch Vehicles: The following flight stage tests will be performed on the AAP-3 and AAP-4 launch vehicles:

a. Manufacturing checkout of the IU's and S-IB and S-IVB flight stages.

b. Static test of the S-IB and S-IVB flight stages.

c. Post static checkout of the S-IB and S-IVB flight stages.

d. KSC inspection tests of the IU's and S-IB and S-IVB flight stages.

6.3 Nose Cone: The following ground inspections and/or analyses will be performed:

a. Development tests.

b. Qualification tests.

c. Manufacturing checkout and acceptance tests.

d. KSC preflight checkout tests.

6.4 AAP Experiments: The following ground tests will be performed:

a. Experiment development tests.

b. Qualification tests for each experiment.

c. Payload integration tests of experiment and associated support systems with carriers.

d. Factory checkout and acceptance test of experiment and associated support systems.

e. KSC prelaunch tests.

6.5 Spacecraft: The following major flight article ground tests will be performed on the AAP-3 CSM:

a. Qualification and/or certification tests on the basic Apollo CSM as required to meet the long duration and other pertinent AAP mission requirements.

b. Qualification tests for AAP peculiar subsystems modifications to verify operation for the AAP-3/AAP-4 Mission.

c. Factory checkout and acceptance tests.

d. Integrated systems tests.

e. KSC prelaunch tests.

6.6 LM/ATM: The LM/ATM shall be fully qualified to support manned operations in earth orbit. In support of this requirement, the following ground tests will be performed:

a. Lunar Module ascent stage:

(1) Manufacturing checkout and acceptance tests.

(2) Qualification and/or certification tests as required to meet the AAP mission requirements.

(3) KSC inspection tests.

b. ATM and modification kits for the LM:

(1) Development tests.

(2) Structural verification tests.

(3) "All-systems" integration tests.

(4) Vibration tests.

(5) Thermal vacuum tests.

(6) Qualification tests.

(7) Manufacturing checkout and acceptance tests.

(8) KSC inspection tests.

c. LM/ATM assembly:

(1) Systems compatibility tests.

(2) "All-systems" tests on systems which bridge the LM/ATM interface (including monitors and controls).

(3) Integrated systems tests.

(4) Prelaunch checkout tests.

6.7 Resupply Expendables Package: The following ground tests will be performed on resupply expendables packaged in the CSM for utilization on this mission:

a. Structural verification tests.

b. Qualification tests.

c. Factory checkout and acceptance tests.

d. Integrated systems tests with CSM.

e. KSC prelaunch tests.

6.8 SLA: The following ground tests will be performed on the AAP-4 SLA as modified to meet mission requirements:

a. Development tests.

b. Qualification tests.

c. Manufacturing checkout and acceptance tests.

d. KSC preflight checkout tests.

6.9 Integrated Systems Tests: Integrated systems tests will be conducted to verify that flight hardware is physically, functionally and operationally compatible with associated ground support systems and mating hardware in the cluster configuration. Cluster configuration tests will be conducted with flight articles where practicable and with flight configured prototypes, simulators or master gauges, as appropriate, when the interfacing flight article cannot be made available. For the AAP-3/ AAP-4 Mission, the following flight hardware interfaces will be verified:

a. CSM - LM/ATM (independent of cluster)

b. CSM - MDA/Airlock

c. LM/ATM - MDA/Airlock

6.10 Prior Flight Missions: All launch vehicle, spacecraft, LM, SLA and nose cone test anomalies resulting from all previous missions which could degrade or interfere with primary objectives will be evaluated and corrected prior to the launch of AAP-3 and AAP-4.

6.11 Design Certification Review (DCR): An AAP DCR will be conducted to certify all new hardware and all changes from the standard Apollo hardware required for this mission. Basic Apollo hardware already certified in previous DCR's will be recertified as required to meet AAP extended life and/or performance requirements. This review will also include certification of experiments likely to affect flight worthiness, manned flight safety and/or mission primary objectives. The DCR shall be in accordance with Apollo Program Directive No. 6A (reference (e)) as to be modified for AAP.

6.12 Certification: A Certification of Flight Worthiness (reference (d)) for each stage, IU, SLA, spacecraft, and LM/ATM is required prior to shipment from the factory and after static firing if appropriate. In addition, experiments whose failure would jeopardize crew safety or the accomplishment of a primary mission objective (Category I or II) will also require preparation of a COFW. Final updated and signed COFW's by the program managers will be required at the Flight Readiness Review and close-out of open items prior to launch will be in accordance with Apollo Program Directive No. 15 (reference (f)) as to be modified for AAP.

7.0 RELIABILITY AND QUALITY ASSURANCE

A Reliability and Quality Assurance Program will be conducted in accordance with the Reliability and Quality Assurance Plan (reference (g)) issued by AAP, R&QA, OMSF.

8.0 RESPONSIBILITIES

Center responsibilities for implementation of this mission are as follows:

8.1 MSFC:

a. Provide the Saturn IB launch vehicles and required vehicle and GSE modifications.

b. Manage the ATM development and provide development and test requirements to MSC concerning ATM controls and displays located in the LM.

c. Develop assigned experiments and supporting hardware.

d. Develop GSE as required for assigned experiments and the ATM.

e. Integrate assigned experiments into the AAP-3 launch vehicle.

f. Integrate all experiments designated for transport in the AAP-4 flight mission.

g. Develop and integrate the nose cone and SLA-IU spacer with the AAP-4 payload.

h. Conduct guidance and control dynamics analyses for the ground launched space vehicle configuration and develop the requisite launch vehicle guidance and control capability.

i. Analyze the cluster maneuver dynamics for the AAP-3/AAP-4 Mission.

j. Conduct analyses in coordination with MSC in the areas of instrumentation and communications, electrical power distribution and expendables distribution for the space module cluster configuration as required for development of the LM/ATM.

k. Provide launch vehicle performance constraints, systems data and guidance support to MSC for mission planning.

l. Provide technical support to MSC concerning crew training procedures and flight operations planning for the LM/ATM, Saturn I Workshop reactivation, and the MSFC assigned/designated experiments.

m. Provide operational support to MSC as required during AAP-3/AAP-4 flight operations.

n. Provide technical support to MSC concerning expendable resupply requirements and hardware development as related to the Saturn I Workshop and LM/ATM.

o. Provide test requirements which are suitable for KSC development of test procedures for MSFC end items.

p. Provide technical support to KSC as required during the acceptance, modification, prelaunch checkout and the launch phases of this mission.

8.2 MSC:

a. Provide the CSM and associated GSE required for the AAP-3 Mission.

b. Modify the LM ascent stage and the AAP-4 SLA as required by MSFC for the ATM.

c. Define the resupply requirements and develop the resupply hardware to sustain a mission of up to 56-days duration.

d. Develop assigned experiments and supporting hardware.

e. Develop GSE as required for assigned experiments and the LM.

f. Integrate assigned experiments with the AAP-3 spacecraft.

g. Conduct LM/ATM operations.

h. Conduct thermal balance analyses for the AAP-3/AAP-4 orbital assemblage.

i. Conduct analyses in coordination with MSFC in the areas of instrumentation and communications, electrical power distribution and expendables distribution for the space module cluster configuration as required for development of the CSM and resupply package hardware.

j. Plan the mission and develop the astronaut flight plan including appropriate inputs from MSFC for the Workshop, LM/ATM and MSFC assigned experiments.

k. Plan and execute flight control, experiment and recovery operations.

l. Train the astronaut crew.

m. Provide test requirements which are suitable for KSC development of test procedures for MSC end items.

n. Provide technical support to KSC as required during the acceptance, modification, checkout, prelaunch and launch phases of this mission.

8.3 KSC:

a. Prepare checkout procedures and conduct prelaunch checkout of the launch vehicles with the associated GSE.

b. Prepare checkout procedures and conduct prelaunch checkout of the spacecraft, resupply package hardware and experiment hardware for AAP-3 with the associated GSE.

c. Install MSC and MSFC supplied kits and conduct modifications to Apollo hardware as required for execution at the launch site.

d. Prepare checkout procedures and conduct prelaunch checkout of the LM/ATM and experiment hardware for AAP-4 with the associated GSE.

e. Plan and execute space vehicle launch operations.

f. Provide technical support as required to MSC and MSFC concerning the KSC implementation of modifications to flight hardware and GSE hardware.

g. Prepare integrated space vehicle checkout procedures and conduct integrated checkout of the space vehicle with its associated ground support systems.

9.0 IMPLEMENTATION

MSC, MSFC and KSC shall develop Mission Requirements documents to implement the requirements stated herein. The MSC and MSFC requirements will be combined in a jointly signed-off directive.

Subsequent changes and future revisions to center Mission Requirements documents noted above which conflict with the requirements stated herein will require coordination between the centers and the review and approval of the Apollo Applications Director. Other revisions to center Mission Requirements documents will be coordinated between centers as required with ten copies submitted to the Director, Apollo Applications, Code ML, for information.

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OFFICE OF MANNED SPACE FLIGHT PROGRAM DIRECTIVE	M-D ML 3200.059 (Project)	DATE May 23, 1968

APOLLO APPLICATIONS
PROGRAM DIRECTIVE NO. 5A

REFERENCE COPY

TO : Distribution

FROM: John H. Disher for
DIRECTOR, APOLLO APPLICATIONS

SUBJECT: Change 1 to Apollo Applications Program Directive No. 5A

The attached changes are to be incorporated into the subject directive on a page-for-page substitution basis. This memorandum shall be attached to the basic document and become part of the directive. Substance of the changes is as follows:

a. Delete requirement for determining feasibility of reactivating the Saturn I Workshop for up to 56 days. This requirement will be met on the AAP-3A Mission.

b. Delete requirement for verification of ability of ground support systems to support extended duration missions. This requirement will be verified for up to 56 days on the AAP-3A Mission.

c. Rephrase secondary objectives statement to include requirement for reactivating Saturn I Workshop experiments.

d. Provide for automatic rendezvous and remotely controlled docking of the LM/ATM.

e. Provide for execution of a CSM-LM/ATM alternate mission.

f. Reactivation and reuse of LM/ATM are now design objectives rather than firm mission requirements. Designs which preclude reactivation and reuse will be submitted for approval prior to implementation.

g. Update general flight plan to new LM/ATM rendezvous and docking concept.

h. Update LM/ATM and CSM configuration requirements.

i. Update AAP-3 experiment priority listing.

Changes are underlined to facilitate identification.

Attachments
(Pages 2, 3, 4, 5, 6 & 7)

OFFICE OF MANNED SPACE FLIGHT PROGRAM DIRECTIVE	M-D ML 3200.059 (Project)	DATE May 23, 1968

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